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# Large-scale precipitation and surface wind extremes in the Mediterranean

Shira Raveh-Rubin and Heini Wernli

Institute of Atmospheric and Climate Science, Department of Environmental Systems Science, Zürich, Switzerland (shira.raveh@env.ethz.ch)

Extreme wind and precipitation events in the Mediterranean are typically associated with the passage of cyclones and their attendant fronts, and often linked to particular topographic features (e.g., mistral, foehn, bora). The majority of previous studies analyze extremes locally, over a short time. However, large-scale (LS) extremes are of particular societal importance for the increased risk for extended flooding and prolonged exposure to strong gusts, potentially leading to severe damage. This study therefore focuses on LS extremes and addresses these unresolved aspects: 1) where and when do LS extremes occur? 2) what are the common precursors and dynamics of LS extremes? 3) do LS extremes in wind and precipitation co-occur?

Here we study these questions focusing on LS surface wind gust extremes (scales of 500-1000 km, 3 days), by identifying events objectively using ERA-Interim data for 1979-2012. Key dynamical processes are shown in a composite analysis and with detailed investigation of selected case studies where extreme precipitation and wind co-occurred, using ERA-Interim data and mesoscale model (COSMO) simulations.

We find that Mediterranean wind extremes are characterized by: 1) a strong anticyclonically curved jet along a stationary upper-level ridge during the 48 hours before the time of maximum surface wind; 2) rapid deepening of the surface cyclone with a shift in its location, creating strong pressure gradients and anomalously dry, cold northerly flow; 3) vertical alignment of upper- and lower-level circulation anomalies and weak static stability, facilitating momentum transfer to the surface. Moreover, topography may accelerate the flow.